Destructive Evaluation of Patch Repairs of Honeycomb Composite Aircraft Sections

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ABSTRACT

This paper presents the results of destructive evaluation of two patch repaired honeycomb aircraft sections. The first section contains two repair patches circular interior and rectangular edge. The two repairs were performed in according to Boeing standards and FAA approved procedures and they are classified as good repairs. The other honeycomb section contains a rectangular interior repair and classified as a bad repair due to simulated defects within the repair patch. The destructive evaluation is focused on sectioning the panels to one inch strips and performing microscopic analysis of the bond surface of the skin as well as performing flexural tests on the honeycomb strips and direct tensile tests on the skin only. Four point loading conditions were adopted for the flexural test. The load versus mid-span deflection was recorded and the mode of failure was monitored. For the direct tensile tests, load versus strain on both parent and patch materials were recorded. The tests results of the flexural and tensile tests of the sections contain patch were compared to those of the same test configurations on sections with parent material only. During the testing program, video camera was used to monitor the failure of the specimens and record the failure initiation.

Based on the testing program and the available data, it appears that patch repair increases the overall stiffness of the panel. Also, the connection between the patch and the parent material may be a point of concern.